Hungary, with existing Australian genera. Baron Ettingshausen himself is largely responsible for these identifications, which have been questioned "by certain critics insufficiently acquainted with the subject." He claims that he was supported in his views by such eminent palæontologists as Franz Unger and Oswald Heer. It is now some years since Unger published his sensational "Neuholland in Europa." In this little work almost every one of a set of Eocene fossil plants is identified with some essentially Australian genus, and often, we should add, on the very slenderest of material. The late Mr. G. Bentham, who, as is well known, handled and described every Australian plant of which specimens had been collected up to his time, disputed the correctness of the identifications, and endeavoured to prove that the remains might well be those of genera still found in the northern hemisphere; yet Baron Ettingshausen gives us to understand that Mr. Bentham confirmed his determination of a European fossil leaf as belonging to the genus *Dryandra*.

Quite recently the Marquis de Saporta has attacked Baron Ettingshausen's position, and the present pamphlet may be regarded as a reply. The author concludes with the statement that, to prevent misunderstanding, he wishes it to be known that any objections or criticisms will meet with no response from him, because he is convinced of the accuracy of his "facts," and his time is too valuable to enter upon superfluous discussion. Without discussing his "facts" one by one, and without actually denying their accuracy, we may say that the illustrations given are by no means convincing, as most botanists who have worked many years in herbaria on plants from all parts of the world, we believe, will agree. Few persons probably have paid so much attention to the venation and forms of leaves as Baron Ettingshausen, yet we find none of his determinations absolutely beyond doubt. So far as we are aware, not a single fruit of *Eucalyptus* or of the assumed *Proteaceæ* has been discovered in the European Tertiary formations. As to his leaves of *Eucalyptus*, they might be matched in the genus *Eugenia*, and we see no reason why any of the others are necessarily remains of species of Australian genera. W. B. H.

Is the Copernican System of Astronomy True? By W. S. Cassedy. (Standard Publishing Co., Kittanning, Pa., 1888.)

AN astronomer nowadays would find it a hard task to bring forth any facts which would throw doubt upon the truth of the Copernican theory, but it appears that there are still people amongst us who are bold enough to attack the strongholds of astronomy. Such attempts are always hopeless failures, and the one under notice is no exception. It is, indeed, doubtful whether the author knows what is meant by the Copernican system, for he goes so far as to suggest that the known diameter of the earth's orbit (assuming that it exists) should be used as a base-line for determining the distance of the sun! He also states that he has "found by experiment" that similar right-angled triangles have sides proportionate in length, though it is only fair to say that he is aware of the existence of the first book of Euclid, if not of the sixth.

We have already said enough to show that the book need not be considered seriously; but we cannot refrain from stating that the author, by sighting the sun along straight-edges at the equinoxes, has found that "the distance of the sun from the surface of the earth, at 40° N., is one million miles (p. 49)." This result is about as near the mark as could be expected from the method employed.

Naturalistic Photography. By P. H. Emerson, B.A., M.B. (London: Sampson Low, Marston, Searle, and Rivington, 1890.)

THE quick call for a second edition of this work indicates the approval with which it has been received, and we may safely say there is not a better or more instructive book on the art principles of photography than the one before us. Dr. Emerson is a photographer of the first rank, his artistic compositions are everywhere admired, and the energetic manner with which many of the old and cherished ideas of the ordinary photographer are attacked and others established makes it very manifest that he only writes what he knows to be true. The literary style of the book is excellent, and the exposition has the merit of being strikingly original; it should, therefore, be studied by every photographer, both amateur and professional, who desires to excel in his art.

LETTERS TO THE EDITOR.

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Acquired Characters and Congenital Variation.

BEYOND this letter I cannot pursue my interpolated adversary, Mr. Dyer.

The syllogisms which he attributes to me are entirely his own. I willingly admit, therefore, that they are as ingeniously bad as they can well be.

I will now state shortly what my position was, and is:—

(1) The assumed antithesis between "acquired characters" and "congenital variation" has arisen out of the cult of Darwin as opposed to Lamarck.

(2) The theory of Lamarck fails, in my opinion, as much as the theory of Darwin, to give any adequate or satisfying explanation either of the genesis, or of the development, of organic forms.

(3) But the theory of Lamarck is more philosophical than the theory of Darwin, in so far as it seeks for, and specifies, a definite natural cause for the phenomena of variation.

(4) The theory of Darwin is essentially unphilosophical in so far as it ascribes these phenomena to pure accident, or fortuity.

(5) That Darwin himself, at one time, if not always, admitted this idea of fortuity to be a mere provisional resort under the difficulties of ignorance.

(6) That the later worshippers of Darwin depart, in this respect, from their master, and making the weakest part of his system the special object of their worship, have set up Fortuity as their idol.

(7) That it is under the influence of this superstition that they now seek to deny altogether that acquired characters can become congenital.

(8) That this denial is against the most familiar experience of Nature, and especially of artificial selection, which is the ante-type and foundation of the whole theory of evolution.

(9) That in all domestic animals, and especially in dogs, we have constant proof that many acquired characters may become congenital.

(10) That it is no answer to this argument to demand proof that the babies of a blacksmith are ever born with the abnormal arm-muscle of their papa.

(11) That in order to avoid and evade the force of innumerable facts proving that many acquired characters may, and do, become hereditary, fortuitists have invented a new verbal definition of what they mean by "acquired."

(12) That this definition is full of ambiguities and assumptions, concealed under plausible words, but the object of which is to limit the meaning of "acquired characters" to gross, visible, palpable changes affecting single individuals, and which the analogies of Nature do not lead us to expect or to suppose can be repeated in a single generation, even if a tendency to their development is really implanted in the race.

(13) That, still farther to render impossible the proof they demand, our fortuitists affix to their definition of the word "acquired," conditions which beg the whole question in dispute. Not only must the new characters be gross, palpable, visible—cases of "hypertrophy," of "extension," or of "thickening,"—but also they must be "obviously due to the direct physical action of the environment on the body of the individual." This is a condition which is irrational. It excludes

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all those fine, invisible "molecular" changes, through which Nature habitually works, and it ascribes to mere outward and mechanical agencies, effects which, alone, we have no reason to suppose they ever can produce.

On the question of "prophetic germs," Mr. Dyer challenged me to produce a single case of organs useless now, but in course of preparation for future use. I replied by referring him to this phenomenon as universal throughout Nature in the life-history of every individual organism; and I also referred him to the well-known idea of Darwinian embryology which establishes a close analogy between the laws governing the development of the embryo, and the whole past development of organic life.

Mr. Dyer replies that I ought to have explained this sooner—when challenged to do so by Prof. Ray Lankester—an observation which has nothing to do with the merits of the question. The truth is, I wished to close my dispute with that distinguished Professor, as I now desire to close it with Mr. Dyer, and I was satisfied with an indirect admission that, as regards every individual organism, my assertion could not be contradicted. What this involves, I left, and now leave again, as unexhausted as it is indeed inexhaustible.

In conclusion, I must observe upon the use Mr. Dyer makes of the phrase "*a priori* argument," which he apparently uses not only for all deductive argument, but for all analytical reasoning. When he says he "has not an *a priori* mind," he really means that he is indisposed to all analysis. This is a very common attitude even with many able and distinguished men—especially when they are devoted to a system, and are the disciples of some prophet, whose words and phrases they gulp and swallow whole. It is an attitude which has its use; but it is not one to boast of. Mr. Dyer's declaration that "the questions at issue with regard to evolution are now, I believe, thoroughly understood by biologists" is the most astonishing utterance I have ever heard or read coming from a scientific man. Discussion with him is useless. He and his friends know all about it. How life began, and how it grew from more to more—the whole secret of creation—"an open scroll, before them lies." I am happy to think that I am not the only searcher—by many thousands—whose pens Mr. Dyer must intervene to stop. There is a great army of us who are conscious above all things of the ignorance of man.

ARGYLL.

Kinellan, Murrayfield, N.B.

IN the number for January 16 (p. 247) Mr. Thiselton Dyer observes that "there are many readers of NATURE who, while taking a general interest in the problems raised by Darwinism, have not followed all that has been written about it." For the benefit of such persons he gives an interesting explanation of Darwin's views on several important points.

I have not read *all* that has been written, but all, I think, that has ever appeared in the pages of NATURE, and with the result that I am more and more convinced of the inadequacy of the Darwinian theory to account for the origin of species. Natural selection is a *vera causa*, but of very limited operation. The theory of sexual selection but partly removes one serious difficulty not of the first magnitude.

I find Darwinians—not Darwin—very ready to insinuate or assert that an unwillingness to adopt their views, on the part of persons who believe in a supernatural revelation, arises from theological prejudice, which hinders them from listening to the voice of reason. I think there is some prejudice on both sides. For myself, fully believing in a Supreme Designer, I am perfectly and most fearlessly willing that "the attempt at mechanical explanation" should be carried as far as possible, well knowing that "a final universal cause" cannot possibly be disproved or reasonably denied. And Darwinism is committed to no such denial.

We have our choice between two alternatives. Life on our globe had a beginning; and its cause was certainly not mechanical or natural,—for reasons not theological, but strictly scientific, in the technical sense of the word. For, as the laws of Nature operate uniformly, if life had ever commenced spontaneously, it must of natural necessity do so again and again, since it would be most absurd to suppose that only during some previous state of the earth's surface did matter exist in such a condition as to be capable of conversion into living things. If life had ever arisen mechanically, it would require a miracle to *prevent* repetitions of the process.

We have, then, to take our choice between supposing with Darwinians that the life-producing power acted once for all, and supposing that it has acted repeatedly and continuously, in more ways than one. I see no theological, and, let me say, no Scriptural, objection to either. Let it be believed willingly, if good reasons can be given, that all life began with a single germ which could not only produce its like—which is wonderful enough—but which even contained in itself such amazing potentialities that it could become, and has become, the parent of every form of life, sentient or non-sentient, that has ever appeared on our globe.

To me this seems scientifically improbable. For why should the power, whether acting intelligently, or, if anyone prefers it, without intelligence, create one germ only? Why not millions? And if of one kind, why not of many? And if single organisms, why not organisms connected with one another, even in highly complex structures? And why act once only? Why not start non-sentient life at one time, sentient at another? For do not sentient things need a separate germ? I take leave to think so. But be this as it may, they are as much in advance of the non-sentient, however much alike those germs we know of may appear to be, as the non-sentient are of inanimate matter.

The other alternative supposition is that the life-producing power, instead of acting once only, and then subsiding into its primæval torpor, continues to act. That, as it once acted upon inanimate matter, not robbing it of anything, but rather, while availing itself of its properties, conferring upon it new powers, so it has acted since upon living things, ever producing out of the old new and higher forms of life; availing itself of all existing faculties of living things, but while allowing them to achieve all that they can, still moulding fresh forms, and conferring higher faculties. To suppose this, is only to suppose that the action of the life-producing power, since life began, has been analogous to what we know was its action in producing life. It is hardly to be supposed that the production of one marvellous germ has exhausted all its energy.

Yet, if the Darwinian theory can enable us to dispense with the aid of this power, let it do so. Let reason prevail.

Darwinians offer, as an adequate explanation of the formation of new species from the older, that this development comes about simply through natural selection—through the survival of the fittest of favourable variations.

"The origin of any species," says Mr. Thiselton Dyer, "lies firstly in the occurrence, and secondly in the selection and preservation, of a particular variation." But surely a particular variation alone—that is, such as can be brought about, as we know from experience, in a single generation—does not sufficiently differentiate one species from another. Short-horned cattle, for instance, are not a new species, nor would they deserve to be so termed if it should eventually happen that all other varieties of horned cattle became extinct. In the great majority of cases, at all events, there must be *more than one* particular variation, before we can recognize a specific difference. Species have become what they are by the *combination*, in one organism, of many particular variations, each well suited to the rest. No particular variation could make of another ruminant a giraffe. What we want, and what seems to be wanting in the Darwinian theory, is a satisfactory hypothesis to explain the *concurrence* of many particular variations, by the co-existence of which in one structure the new species is constituted. Variations, or "fluctuations," as Mr. Thiselton Dyer has happily termed them, will not account for this. Between some species there may be merely slight and single differences; but Nature can show us much more than this. We often find a complicated apparatus formed by the concurrence in one individual of many particulars of structure combining to produce an effect wholly peculiar.

Take the following instance, or rather group of instances. There are venomous serpents, of many species and in many lands, which differ most widely from the non-venomous kinds, from which, or from the ancestors of which, they are generally believed to have been derived. In these we find, to begin with, teeth which have undergone strange modifications. They are needle-like in shape. They are not fixed in the jaw. They occupy a very prominent position. They have minute perforations, terminating near, but not precisely at, the point. They have muscles by which they may be recurved, so that their points may be directed towards the throat. They have hollows in which to lie. They have muscles by which, on occasions, they may be projected beyond the mouth. Besides all this poison-secreting glands, and poison-bags, and channels of com-

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